INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior

National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)
Exp. Date (11/30/2010)
Form No. (10-226)

Reporting Year:	**Park:**	**Select the type of permit this report addresses:**
2009	Shenandoah NP	Scientific Study

Name of principal investigator or responsible official:	**Office Phone:**
Frank Panek	304-724-4431
Mailing address: USGS/Leetown Science Center National Fish Health Research Laboratory 11649 Leetown Road Kearneysville, WV 25428 USA	**Office FAX** 304-724-4435 **Office Email** fpanek@usgs.gov

Additional investigators or key field assistants (first name, last name, office phone, office email)

Name: Anne Henderson	**Phone:** 304-724-4452	**Email:** ahenderson@usgs.gov
Name: Don Kain	**Phone:** 540-574-7815	**Email:** dgkain@deq.virginia.gov
Name: Rocco Cipriano	**Phone:** 304/724-4432	**Email:** rcipriano@usgs.gov
Name: Steve Reeser	**Phone:** 540-248-9360	**Email:** steve.reeser@dgif.virginia.gov

Project Title (maximum 300 characters):

Evaluating possible reservoirs of Aeromonas salmonicida in the South Fork of the Shenandoah River: Salmonid and coldwater influences.

Park-assigned Study or Activity #:	**Park-assigned Permit #:**	**Permit Start Date:**	**Permit Expiration Date:**
SHEN-00361	SHEN-2009-SCI-0021	Oct 06, 2009	Oct 31, 2009

Scientific Study Starting Date:	**Estimated Scientific Study Ending Date:**
Mar 11, 2009	Sep 30, 2009

For either a Scientific Study or a Science Education Activity, the status is:

Completed

For a Scientific Study that is completed, please check each of the following that applies:

_X_ A final report has been provided to the park or will be provided to the park within the next two years

__ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park

__ All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed

Activity Type:

Research

Subject/Discipline:

Fish / Ichthyology

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

The Virginia Department of Environmental Quality and the Department of Game and Inland Fisheries, along with their partners on the Shenandoah River Fish Kill Task Force (including the USGS), have researched putative causes of the fish kills that have occurred in the Shenandoah River watershed since 2004. The Shenandoah River has been one of the best smallmouth bass fisheries in the United States, but an estimated 80% of the adult smallmouth bass and redbreast sunfish were lost in 2004-2005. About 75 miles of the

North Fork Shenandoah River were impacted in 2004 and 100+ miles of the South Fork and mainstem Shenandoah were affected in 2005. Adult smallmouth bass and redbreast sunfish exhibited bacterial lesions that resulted in mortality, following the first major precipitation/runoff event in the spring.

There has been much discussion to determine whether or not Aeromonas salmonicida may be a primary pathogen of these fish. As the summer progressed, water temperatures increased, mortality subsided, and it was also observed that some of the lesions on affected fish began to heal. Aeromonas salmonicida is considered a cold or, at best, a cool water pathogen and, therefore, it is not surprising that the warmwater temperatures of the summer were not conducive to additional lesion development and mortalities induced by A. salmonicida. It is even questionable if the bacterium survived in the rivers during the summer because water temperatures were indeed close to its lethal limit. This poses a significant question and one that has great management implications. Can A. salmonicida survive the summer temperatures of the Shenandoah and James Rivers and establish asymptomatic carrier states in smallmouth bass or other native fishes?

There remains the need to identify if A. salmonicida is the primary cause of the lesions and mortalities in fish kills in the South Fork of the Shenandoah River, and in other rivers such as the Cowpasture, Jackson, and upper James Rivers. Although the data presented thus far does indeed indicate that this pathogen was indeed a causative agent of the spring 2007 and 2008 lesions and mortalities, the data are only pertinent to those particular years.

Only additional sampling will be able to evaluate the persistence of A. salmonicida as a putative agent for the extended fish kills. To further evaluate and confirm the etiology of infections in the Shenandoah, James, Jackson, and Cowpasture Rivers, the following studies are proposed. These studies are essential to confirm bacterial etiology by 1, Fulfilling Kochâ s postulates; 2, determining if contagion is affected by fish-to-fish contact or broad dispersion in the environment; and 3, evaluating innate and acquired resistance of riverine fishes to infection.

Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

During 2009, 20 trout were anlyzed from Madison Run and Big Run that flow from the Shenandoah National Park into the South Fork of the Shenendoah River. Brook trout withiin both runs were sampled in March, June and October to coincide with periods before, during and after (respectively) disease, caused by Aeromonas salmonicida, occurred within the Sout Fork of the Shenandoah River. Sampling was performed by non-lethal culture of bacteria from the gills and skin of each fish. The fish were then returned to their respective streams without injury.

In Madison River, Aeromonas salmonicida was only detected on one brook trout and represented 0.6% of the total bacterial distribution on the skin of these trout during June when the pathogen was also causing problems among smallmouth bass in the Shenandoah River. Weekly water samples were also processed just before the run entered the Shenandoah River from March 2 through July 20. Bacterial counts ranged from 2.0x10e2 to 8.0x10e3 total colony forming units per 100 mL of water. Aeromonas salmoicida was not recovered from the water in Madison Run. Because of the very low incidence of infection (1 fish in June) and inability to find the pathogen shed into the water column, Madison Run was not cnsidered to be a possible reservoir of infection of A. salmonicida in the Shenendoah River.

Aeromonas salmonicida was more prevalent among fish sampled in Big Run. Although al fish in the early March sample tested negative, fish from the May and October samples were positive. In May, Aeromonas salmonicida was recovered from the skin of two brook trout and represented 1.2% of the total microbial flora of the sermis at this time. It was also isolated from the gills of 6 fish where it comprised 5.5% of the toal microbial flora. In October, the bacterium was recovered from the skin and from the gills of two fish and comprised 2.4% and 0.4% of the toal microbial flora on the skin and gills, respectively. Aeromonas salmonicida. however, was not recovered from weekly water samples processed just before the run entered the Shenandoah River from March 2 through July 20 . Total bacterial counts ranged from 3.0x10e3 to 1.2x10e4total colony forming units per 100 mL of water. Even though some fish from Big Run tesed positive for A. salmonicida in both May and October, the location of these fish were at least three miles away from where the run entered the Shenandoah River. Because of thi distance and th inability to detect he pathogen in water sams at the mouth of the run, we concluded that it would not be a principal reservoir for the infections occurring within the South Fork of the Shenandoah River.

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?

No

Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):	Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):
$0	$10000

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:

Paperwork Reduction Act Statement: A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information is estimated to average 1.625 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3127 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.